What is claimed is:

1. A method for producing a digital topographic map, comprising the following steps of:

a step for dividing a basic map, which is produced through UTM drawing method, into grid-like sectors at a predetermined distance, and further dividing the sector obtained into a smaller one, thereby producing small sectors while interpolating discontinuous data being in short between each sectors and within each of the sectors;

a step for producing digital data by relating x, y coordinates of the small sector obtained and a sea level obtained through measurement, upon basis of an algorithm having a rationality, and connecting the small sectors being same in the sea level thereof with a straight line, thereby producing a first topographic map, on which contour lines are formed with lines of segments; and

a step for conducting a smoothing process upon the contour lines of said first topographic map, mathematically, thereby producing a second topographic map, on which the contour lines are formed with curved lines, being smoother than the contour liens of said first topographic map, which are formed with the lines of segments.

2. The method for producing a digital topographic map, as described in the claim 1, wherein the digital data for producing said second topographic map therefrom is stored with map element data into a recording means, and those data are displayed on a display means, being composed into a single or a layer structure thereof, or can be outputted on a paper or the like, as a topographic map.

3. The method for producing a digital topographic map, as described in the claim 1 or 2, wherein a checking function is provided for checking on whether the mathematical process is conducted, appropriately or not, so that the lines of segments come cross

with each other, when producing said first topographic map, by connecting said small sectors having the same sea level, sequentially.

4. The method for producing a digital topographic map, as described in one of the claims 1 to 3, wherein the irregular quadrilateral, which is produced upon basis of the basic map and the map elements through said UTM drawing method is revised and interpolated, mathematically, to be a right-angled quadrilateral, thereby producing a third topographic map.

5. The method for producing a digital topographic map, as described in the claim 1, wherein user map elements, which are produced independently by a user, are stored into said recording means as a database, and those user map elements and said third topographic map are displayed on said display means, being composed into a single or a layer structure thereof, or can be outputted on a paper or the like, as a topographic map.

6. A method for producing a digital topographic map, comprising the following steps of:

a step for dividing a basic map, which is produced through UTM drawing method, into grid-like sectors at a predetermined distance, and further dividing the sector obtained into a smaller one, thereby producing small sectors while interpolating discontinuous data being in short between each sectors and within each of the sectors;

a step for producing digital data by relating x, y coordinates of the small sector obtained and a sea level obtained through measurement, upon basis of an algorithm having a rationality, and connecting the small sectors being same in the sea level thereof with a straight line, thereby producing a first topographic map, on which contour lines are formed with lines of segments;

a step for conducting a smoothing process upon the contour lines of said first topographic map, mathematically, thereby

producing a second topographic map, on which the contour lines are formed with curved lines, being smoother than the contour liens of said first topographic map, which are formed with the lines of segments;

5　　　　a step for revising and interpolating the irregular quadrilateral, which is produced upon basis of the basic map and the map elements through said UTM drawing method, mathematically, to be a right-angled quadrilateral, thereby producing a third topographic map from said second topographic map; and

10　　　　a step for storing digital data for producing said third topographic map, into a recording means, together with map element data, and thereby displaying those data on a display means, being composed into a single or a layer structure thereof, or outputting them on a paper or the like, as a topographic map.

15　　　　7. The method for producing a digital topographic map, as described in the Claim 6, wherein upon the third topographic map displayed on said display means are displayed a color scale, which is divided by colors depending upon the sea levels, and a dialog having a slide bar, which is freely movable along said color scale, 20　whereby said third topographic map can be colored by an arbitrary color for each of the sea levels by moving said slide bar along with said color scale.

　　　　8. The method for producing a digital topographic map, as described in the Claim 6, wherein upon said third topographic map 25　displayed on said display means are displayed a sea level displaying column for indicating a sea level of an arbitrary contour line therein, and a dialog having a color palette for designating a color of the contour lien to be colored, whereby the contour lines of said third topographic map can be colored with an arbitrary 30　color for each of the sea levels thereof by inputting the sea level of the contour line to be colored into said sea level displaying column and a color through said color pallet.

9. The method for producing a digital topographic map, as described in any one of the Claims 6 to 8, wherein a sub-screen is displayed on said display means, on which said third topographic map is displayed, and on said sub-screen are displayed a third topographic map on a periphery continuous with the third topographic map of an arbitrary place that is displayed on said display means, by a map number and/or a map name.

10. The method for producing a digital topographic map, as described in any one of the Claims 6 to 9, wherein on said display means is displayed said third topographic map, together with an X-axis cursor and a Y-axis cursor intersecting in a cross, whereby displaying latitude and altitude of said intersecting point are displayed in a portion of said display means, by moving said X-axis and said Y-axis cursors into an arbitrary direction, so as to fit the intersecting point at an arbitrary place on said third topographic map.

11. The method for producing a digital topographic map, as described in any one of the Claims 6 to 10, wherein points are set up in plural numbers thereof on said third topographic map displayed on said display means, and those plural numbers of points are connected by a straight line or a smoothly curved line, whereby displaying a cross-section of said third topographic map, being cut by said straight line or said curved line, in a part of said display means.

12. The method for producing a digital topographic map, as described in any one of the Claims 6 to 11, wherein arbitrarily two (2) points are set up on the contour line, having the same sea level upon said third topographic map displayed on said display means, intersecting a river thereby, and those two (2) points are connected with a straight line, whereby displaying a cross-section of the river cut by said straight line, in a part of said display means, and also calculating out pondage in an upstream side thereof than said straight line, from said contour lines, and said straight line and said cross-section.

13. The method for producing a digital topographic map, as described in any one of the Claims 6 to 12, wherein arbitrarily two (2) points are set up on the contour line, having the same sea level, surrounding a lake or a swamp on said third topographic

5   map displayed on said display means, intersecting the lake or the swamp thereby, and those two (2) points are connected with a straight line, whereby displaying a cross-section of the lake or the swamp cut by said straight line, in a part of said display means, and also calculating out pondage of said lake or the swamp, from said

10   contour lines and said cross-section.

14. The method for producing a digital topographic map, as described in any one of the Claims 6 to 13, wherein upon said third topographic map displayed on said display means is displayed an arrow of indicating a direction and/or a magnitude of an

15   inclination of configuration of land.

15. An apparatus for producing a digital topographic map, comprising:

a means for dividing a basic map, which is produced through UTM drawing method, into grid-like sectors at a predetermined

20   distance, and further dividing the sector obtained into a smaller one, thereby producing small sectors while interpolating discontinuous data being in short between each sectors and within each of the sectors, and reading sea levels from digital data of the digital topographic map, so as to be aligned on a plane to

25   be blocked, thereby producing mesh-like data, and further storing them as vector data therein;

a means for producing a first topographic map, by reading out the vector data for each of the small sectors stored in said storing means, so as to conduct a process of connecting the each

30   small sector with a straight line while selecting a measurement point in vicinity thereof when the sea is same judging from data of defining tolerance on the sea level, without intersection on those line segments with each other, upon basis of an algorithm

having rationality;

a means for producing a second topographic map, by conducting a smoothing process upon curved lines, passing through a contact point of the line segments of said first topographic map obtained
5   in said process, and having continuous differential coefficients, mathematically, thereby producing the second topographic map, on which the contour lines are made up with a group of curved lines;

a means for producing a third topographic map from said second topographic map, by revising and interpolating an irregular
10   quadrilateral, which is produced upon basis of said basic map produced through the UTM drawing method, and also map elements, mathematically, into a right-angled quadrilateral;

a recording means for storing therein said digital data for producing said third topographic map, together with map element
15   data; and

a display means for composing the digital data stored within said recording means into a single or a layer structure, so as to display thereon.